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# **More Production Through Better Practices**

by D. M. Keyes

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Agricultural Experiment Station  
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IN COOPERATION WITH THE BUREAU OF AGRICULTURAL ECONOMICS  
UNITED STATES DEPARTMENT OF AGRICULTURE

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# More Production Through Better Practices<sup>\*</sup>

by D. M. Keyes<sup>†</sup>

**I**N UPSHUR COUNTY, West Virginia, as in much of the mountainous area of the Appalachian Region, there is maldistribution in the holdings of suitable agricultural land along with limited acreage per farm. This makes it difficult to provide present farm families with full family employment and with adequate incomes from farm work alone. Many farmers have increased the size of their business through purchase of additional land. Further expansion by this method is strictly limited for the near future. If farmers are to expand their business further, they must look to more efficient operation of facilities now in use, particularly land resources. A large measure of improvement can be brought about through wider adoption of crop and livestock-management practices that usually result in higher rates of production. It was to explore these possibilities in an area of critical shortage of suitable agricultural land that this study was undertaken.

## PURPOSE OF STUDY AND PROCEDURE

The purposes of the study as set forth in this report were (1) to enumerate the most essential practices that should be carried out for selected crop and livestock enterprises; (2) to find out what production practices are now being followed by farmers in a selected area; (3) to contrast the requirements for each practice under usual conditions with suggestions for recommended and maximum production; and (4) to indicate the association between systems and sizes of farms and the extent to which practices are up to the recommended levels.

Under each production practice three levels were considered: usual, recommended, and maximum. The first was the usual performance as reported by the farmers interviewed. The second or recommended level was that recommended by the specialists as being reasonable for success-

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**From the Federal Bureau of Agricultural Economics:** James C. Downing, former leader for the region, assisted in initiating the study. R. J. Saville, present leader, revised and edited the manuscript for publication.

The author is especially indebted to the farmers of Upshur County who supplied the information about their farms for use in this study.

<sup>\*</sup>A study conducted jointly by the College of Agriculture, West Virginia University, and the Division of Farm Management and Costs, Bureau of Agricultural Economics, United States Department of Agriculture.

<sup>†</sup>Formerly assistant agricultural economist, W. Va. Agricultural Experiment Station, then associate agricultural economist, Bureau of Agricultural Economics, U. S. D. A., resigned January 1944. Mr. Keyes helped organize the study, did the field work, analyzed the records obtained, and prepared the preliminary draft of the report.



ful operation. The third or maximum was that suggested by the specialists as needed for the greatest production; *i. e.*, the point beyond which further outlay of time and materials would fail to give additional increases in production. For example, 1000 pounds of 4-12-4 fertilizer applied per acre would be considered the maximum if a larger amount yielded no further increase. Only under the greatest needs for food would this be desirable, and only with the very highest prices would it be profitable.

The enterprises selected for study included corn, hay, pasture, dairy cattle, poultry, beef cattle, and sheep. Information as to actual practices followed was obtained from the farmers by interview during October 1943. The individual practices and the requirements to meet each practice, for both recommended and maximum production, were supplied by the production specialists of the West Virginia College of Agriculture. The specialists considered each enterprise to be studied and suggested a list of important practices to be included in the field schedule for each. Also, they provided for each practice the best recommendations for attaining increased efficiency of production and for reaching the maximum level of production. The questions on the schedule were designed to evaluate farmers' actual practices.

It is recognized that some distinction should be made in adopting certain practices. Land suited to crop production is limited by variations in topography. Hence practices governed by physical conditions are limited, while other practices depend wholly on managerial action such as the application of lime. The emphasis should be placed on getting changes in those matters over which the farmer has managerial control and which lend themselves to adjustment.

Field information was obtained from 96 farmers, but not all of these operated all of the enterprises discussed in this study; nor did they always provide usable information for the enterprise. Those interviewed included most of the same farmers who provided information in 1943 for use in connection with Part III of the study of maximum production capacity. Their farms had been grouped according to size and different systems of farming as indicated by livestock and crop organization, from data obtained from AAA records.<sup>1</sup> For purposes of consideration of size and system in this study the farms were grouped as follows:

1. Farms with less than 4 war units, later referred to as subsistence farms.
2. Dairy farms with 4 through 10 war units.
3. General and livestock farms with 4 through 10 war units.
4. Dairy farms with more than 10 war units.
5. General and livestock farms with more than 10 war units.

The "war unit" is considered adequate for the purpose of indicating the dominant sizes and systems of farming from which to measure the levels of accomplishment.<sup>2</sup>

<sup>1</sup>For a complete description of the method of determining organizations of the farms and of the land resources and utilization, see Maximum Wartime Production Capacity of West Virginia Agriculture, Part III, on Maximum Wartime Capacity by Farm-Size groups in Upshur County, West Virginia, West Virginia Agricultural Experiment Station and Extension Service, in cooperation with the U. S. Department of Agriculture, July 1943.

## PROBLEMS THE FARMERS FACE IN UPSHUR COUNTY

Upshur County was selected for study because it is typical of a large segment of the Appalachian Region in which shortage of land suitable for farming, or maldistribution in the way it is presently held, is acute, and in which increased production of farm products is essential to the welfare of the people. Also, it was possible in this county to make use of data already assembled in previous studies and of a selected sample to represent existing farming conditions.\*

West Virginia is a deficit food-producing area for nearly all farm products. Also, there is a strong demand from large urban markets outside the state.<sup>3</sup> Therefore increased production of farm products would help meet the needs of both local and nearby markets for food supplies. In return it would give farmers much-needed increases in cash incomes.

In Upshur County good farm land is scarce in relation to the number of farmers. The rough land, the low natural fertility of the soils deriving mainly from sandstones and shales, the very low proportion of the land area that is suitable for cultivation without special soil-conserving practices, and the extremely large area that is suitable only for grazing and woodland under varying degrees of special restrictions — all these add emphasis to the need for effective management practices.<sup>4</sup>

The low average percentage of farm land suitable for crops, the absence of any large acreage of intensive cash crops, the small crop acreage, and the small gross farm income per capita of farm population add weight to the need for ways to intensify operations on the available land area. These conditions are well represented in the agriculture of Upshur County, which is typical of a large segment of Northern West Virginia. Hence improvements suggested on the basis of findings there may be found applicable to a much larger area of the Appalachians.

### USUAL, RECOMMENDED, AND MAXIMUM PRACTICES FOR CROP ENTERPRISES

The most important practices in crop production in West Virginia are: (1) applying enough lime to make the fertilizer effective for the crops grown; (2) using adequate amounts of high-grade fertilizer; (3) selecting and planting seed of recommended varieties; (4) following desirable cropping systems; (5) controlling pests and diseases; (6) planting at the proper time; and (7) adopting soil-conserving practices which include contour cultivation, strip cropping, winter cover crops, and the selection of more nearly level land for the intertilled crops. Of these,

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\*See footnote 1.

<sup>2</sup>"War unit" is a wartime term developed as a measure of the size of farm business for use in indicating the farm labor needs and subsequently for use in granting deferment from military service for agricultural production. All crops and livestock were given a rating in terms of numbers of acres or of animals to equal a war unit. The crops and livestock were expressed as units and when added gave the total war units for the farm.

<sup>3</sup>Miller, L. F. *Dairying as an Economic Enterprise in West Virginia*. W. Va. Agricultural Experiment Station, Bulletin 311, September 1943, page 5.

<sup>4</sup>See *Atlas of Agricultural Information, Appalachian Region*, USDA, Regional Inter-Bureau Committee on Postwar Planning, July 1942.

the application of adequate amounts of lime and of fertilizer is highly important in increasing crop yields. Lime and fertilizer are also important in conserving soil, since additional plant food is needed to provide adequate cover.

### Practices in Corn Production

Corn is the most important grain crop in West Virginia. Recommendations include use of more lime, a legume hay as the preceding crop, heavy applications of manure, a winter grain or hay crop for winter cover, and use of strip cropping on the contour, compared with the usual practices followed by farmers (see Table 1). To obtain maximum results would require much heavier applications of fertilizer and of manure and as full use as possible of level land, which is generally the most productive soil. However, the limited acreage of level land means that much corn must be grown on sloping land.

In production of corn, farmers approached more closely the recommended practice requirements than in the production of other crops. This was particularly true of the analysis and rate of applying fertilizer and of the use of the proper hybrid seed. Subsistence farms were more

TABLE 1—Requirements for usual, recommended, and maximum production practices for corn in Upshur County, West Virginia

PRACTICE	DESCRIPTION OR UNIT	REQUIREMENTS TO MEET THE PRACTICE		
		Usual <sup>1</sup>	Recommended <sup>2</sup>	Maximum <sup>3</sup>
Liming	Tons applied every 10 yrs.	1 to 2	2	2
Fertilizing	Kind Pounds annually	4-12-4 250	4-12-4 250	4-12-4 500
Seeding	Recommended varieties	Ohio W17 Iowa 939	Ohio W17 Iowa 939	Ohio W17 Iowa 939
Preceding crop	Kind	Mixed hay	Legume hay <sup>4</sup>	Legume hay <sup>4</sup>
Strip cropping	xx	None	Contour	Contour
Contour cultivation	xx	Partially	Fully	Fully
Winter cover	xx	Hay	Winter grain or hay crop	Winter grain or hay crop
Manuring	Tons annually	None	6	10 <sup>5</sup>
Topography	xx	Level or gently rolling	Level or gently rolling	Level

<sup>1</sup>How farmers interviewed usually carried out the practice indicated.

<sup>2</sup>Recommended way to carry out the practice indicated under existing farm conditions for successful operation.

<sup>3</sup>How the practice indicated should be carried out for maximum production.

<sup>4</sup>Occasionally corn may follow pasture. However, due to the extreme shortage of land for crops little suitable cropland would be used for pastures in the rotation.

<sup>5</sup>Applied either on corn or hay but not on both.



frequently deficient in reaching recommended levels for all practices than were dairy or general and livestock farms. A few more of the operators of the smaller dairy as well as general and livestock farms applied adequate amounts of fertilizer and did more contour cultivating than appeared for larger farms. All other farmers used some fertilizer, the most frequent application being 200 pounds per acre of 2-12-6 or 0-20-0. Since fertilizer on all the farms was put in the hill, the smaller amounts were quite effective. Insofar as other practices were concerned — other than that a noticeably greater share of the larger farms had level land — there seemed to be few consistent relationships between farm size and type and the prevalence with which recommended requirements were met.

It was not the usual practice to spread manure on land planted to corn, although operators of the smaller dairy farms and of the larger general and livestock farms applied 6 tons or more per acre on land for corn.

Hybrid seed corn was planted most frequently on the large dairy farms, although all dairy farms showed more frequent use of hybrid seed than did other farms. White corn was usually grown where hybrid seed was not used. (This has been developed through the process of selection to the place where it produces good yields.) Many of the farmers using hybrid corn grew a small patch of white corn for corn meal.

More than one-half of all farmers interviewed had applied 2 or more tons of lime per acre within the past 5 years. Another 30 percent had applied a limited amount of lime, usually 1 ton to the acre. A smaller proportion of the subsistence farmers than of the general and livestock or of the dairy farmers had used adequate amounts of lime per acre. Until recent years little or no lime or commercial fertilizer had been used on some farms. A number of the farmers said they had never used lime before it was distributed by the AAA, and many of them had never purchased any lime.

Soil-conserving practices including strip cropping, contour cultivation, and winter cover were reported more frequently by operators of dairy and of general and livestock farms than by operators of subsistence farms. These practices were being used on the smaller farms of the dairy and the general and livestock systems just about as frequently as on the larger farms. Far fewer subsistence farmers than general and livestock and dairy farmers planted corn on land of suitable topography. Their farms usually were on the rougher land. Sod crops preceded corn more frequently on the general and livestock than on the dairy farms. Subsistence farmers and large dairy farmers most frequently planted corn on the same ground more than one year.

Conservation is measured not only by the number of farms on which recommended practices are reported but also by the *acreage of land* on which the practices are applied. Some significant differences appear between system and size groups of farms. Soil-conserving practices were in effect on a much larger percentage of the acreage on the larger gen-

eral and livestock farms than on other farms, and more were in use on the dairy farms than on the smaller general and livestock farms. As might be expected, the subsistence farms ranked last in this respect.

### Practices in Hay Production

Farmers can go much farther than they have in meeting recommendations as to practices for increased production of clover and timothy hay. The College of Agriculture recommends a regular rotation in which the land remains in clover and timothy hay only 1 or 2 years; earlier harvesting; heavier applications of lime, manure, and fertilizer; inoculation of the legume seed; earlier seeding of clover than is usually practiced; and fall seeding of timothy (see Table 2). For maximum results still heavier applications of lime and fertilizer are indicated, with planting to be on level to gently rolling land and with a heavy application of fertilizer on the crop preceding the hay crop. Because of the limited supply of level land, hay would have to be grown on rolling land, even under maximum production.

Clover and timothy are the principal kinds of hay seeded. Most farmers tend to keep established meadows for a long time, some of them permanently. As a result of the long rotations, the quality of clover and timothy hay is reduced sharply after 2 years because clover, being a biennial, disappears from the mixture except for volunteer seeding. This reduces annual hay yield from the land.

TABLE 2—Requirements for usual, recommended, and maximum production practices for clover and timothy hay in Upshur County, West Virginia

PRACTICE	REQUIREMENTS TO MEET THE PRACTICE		
	Usual	Recommended	Maximum
Age of seeding (yrs.)	3 to 5	1 to 2	1
Times cut	1	2	2
Seeding date (month)	April or May	Timothy — September or October <sup>1</sup> Clover — March or April	
Seed mixture	Timothy and clover	6 to 8 lbs. timothy 6 to 8 lbs. clover	6 to 8 lbs. timothy 6 to 8 lbs. clover
Tons lime per acre	1 to 2	3	4
Tons manure per acre	None	5	10 <sup>2</sup>
Inoculation of seed	Not inoculated	Inoculate	Inoculate
Topography	Gently rolling	Gently rolling	Level
Previous crop	Wheat, oats	Wheat, oats	Wheat, oats
Fertilizing for nurse crop when hay is seeded	200 to 300 lbs., 0-20-0	350 lbs., 3-12-6	500 lbs., 3-12-6

<sup>1</sup>Depends on the date small grain is seeded: Wheat and barley — September or October; oats — March or April.

<sup>2</sup>Applied either on corn or hay but not on both.

March or April<sup>5</sup> is the recommended time for seeding clover, and September or October is the best time to sow timothy. Timothy should be seeded at the time the small grain is seeded either in the fall or early spring. When timothy is seeded with winter wheat or barley in the fall, less seed is needed. Farmers reported that the most usual time of seeding clover and timothy in 1943 was in April and May in either wheat or oats.<sup>6</sup>

Since oats are usually planted in April, this sets the date for the seeding of the hay crop. Some hay was seeded in corn and in buckwheat. Seeding in the corn was done during the last of July or early in August.

Most farmers used some clover in the seed mixture for hay, but few knew the exact amount, as they usually bought the seed already mixed. A rate of seeding per acre of 6 to 8 pounds each of clover and timothy is recommended, with perhaps some economy in seeding slightly less timothy and somewhat more clover seed. It is good insurance to inoculate the clover seed particularly if it is to be planted where clover has not been grown recently. Very few farmers carried out this practice. Some never had inoculated the seed; others explained that there was no need for it since clover had been grown on the land for many years.

Wide variations occurred in the tendency of farms of different types and sizes to meet recommended requirements for practices in production of clover and timothy hay. Operators of small farming units rotated their hay land more frequently and used a better seed mixture than did those on larger farms. But operators of the larger farms seeded at a more desirable time, inoculated the seed, and applied lime in more instances than occurred for smaller farms. Subsistence farms showed a decided lack in application of lime and manure; they failed to inoculate the clover seed, and they applied little fertilizer.

While a large number of farmers used some lime or fertilizer, few used enough for best results. The amount of lime needed for good hay production is greater than that needed for corn. Much of the fertilizer used was less effective than it could have been, had it been spread at time of seeding rather than after the hay stand was established.

### Practices in Pasture Development

Farmers have given less attention to bringing about improvements in pastures than they have in crops. Most of this remains for the future. Mowing, management of the grazing period, liming, and fertilizing are essential items for pasture development. The recommendations include 1 to 1½ tons of ground limestone every 10 years, 400 pounds of fertilizer every 4 years, mowing the weeds off twice annually, and restricting the grazing period to from approximately May 1 to November 1 (see Table 3). To obtain maximum results, the rate of fertilizing should be increased sharply. The usual practices followed by farmers showed decided neglect for all items except the grazing period.

<sup>5</sup>March 15 to April 20 would be optimum.

<sup>6</sup>In 1943 the rainy season delayed spring oat seedings so that much planting occurred in May. Normally seeding would occur mainly in March and April.

TABLE 3—Requirements for usual, recommended, and maximum production practices for pasture in Upshur County, West Virginia

PRACTICE	UNIT OR KIND	REQUIREMENTS TO MEET THE PRACTICE		
		Usual	Recommended	Maximum
Liming	Tons ground lime every 10 years	1 ton on 10 % of area	1½	1½ <sup>1</sup>
Fertilizing	Lbs. 0-20-0	200 lbs., every 3 yrs., on 13 % of area	400 lbs. every 4 years	800 lbs. every 4 years
Mowing	Times mowed annually	Half of area once	Twice annually	Twice annually
Grazing period	Months	April 15-Nov. 1	May 1-Nov. 1	May 1-Nov. 1

<sup>1</sup>If land is badly in need of lime a second application should be applied in 5 or 6 years rather than every 10 years.

More than one-half of the farmers interviewed used some fertilizer on pasture, but only 13 percent of the total area received any application. There was no general intention to step up the area fertilized or the rate of application per acre during 1943. About two-thirds of those fertilizing pastures used 200 pounds of 0-20-0 per acre, or one-half the recommended amount.

Seventy percent of the farmers applied some lime on pastures annually, but only 10 percent of the land area in pastures on all farms studied received lime. About two-thirds of the farmers applying lime used 1 ton of ground limestone per acre; the others reported 1½ to 2½ tons per acre, which is more in line with recommendations of the College of Agriculture.

Fifty-nine percent of the farmers mowed part or all of the pasture in 1943. None mowed pasture land more than once, and only one-half of all pasture land was mowed. Undoubtedly the rough topography of many pastures makes this practice difficult, in some instances even impossible. An additional number went through the pasture with a scythe and clipped the brush. Forty-two percent used hay meadows for supplementary pasture. The usual practice was to turn the livestock in after one crop of hay had been cut. On the smaller farms the meadows were pastured most frequently in September, October, and early November.

About 60 percent of the work stock and of the dairy cattle were pastured from May to October or for shorter periods, but only one-fourth of the beef cattle were limited to this period. Generally, beef cattle were turned on pasture in April and kept there untill late November or early December. Fourteen percent of the farmers reported dairy and beef cattle on pasture the year around. Most of these cattle were kept on hay meadows in the bottom lands during the winter. Feeding over hay meadows was practiced most generally on the livestock farms with large numbers of stocker cattle. Sheep were usually allowed to run on pasture all year.



A much higher percentage of all pasture land on large dairy farms and all general and livestock farms was mowed than on small dairy farms and subsistence farms. The larger general and livestock farms and the dairy farms observed more of the recommended levels for liming and fertilizing than did the smaller farms of these types, but even these levels were very low and not greatly different from accomplishments on subsistence farms. This indicates that large opportunities lie ahead in feed production through getting many more farmers to carry out improved pasture-management practices on a much larger acreage.

## **USUAL, RECOMMENDED, AND MAXIMUM PRACTICES FOR LIVESTOCK PRODUCTION**

Highly significant practices for increased livestock production in West Virginia are: (1) quality in the breeding of animals; (2) rates of feeding, composition, and quality of feeds; (3) sanitary conditions, including control of pests and diseases; (4) adequacy of shelter; and (5) handling of animals. All these are important; when carried out together as improved practices they will result in substantial increases in rates of production. Some of these, such as breeding, bring improvement gradually, while others, such as rates of feeding and sanitary conditions, may bring fairly immediate responses. Detailed analyses showing usual, recommended, and maximum levels for different practices are presented here for dairy cattle, poultry, beef cattle, and sheep.

### **Practices in Dairying**

Recommendations for many important production practices in dairying are still much above what most farmers are doing. The dairy enterprise can be made to contribute much more to the agriculture of West Virginia, if appropriate emphasis is given to things most essential to improvement. Significant recommendations call for greater emphasis on animal selection and breeding for increased milk production, better balanced rations, ample supply of drinking water, grain feeding of dry cows, and use of more legume hay in the roughage (see Table 4). In handling calves the suggestions include feeding much less whole milk, grain feeding of replacement stock, and breeding dairy heifers at an older age.

At the maximum level the suggestions place still greater emphasis on purebred animals, still heavier grain feeding of high protein content, ample drinking water, and less dependence on pasture at the beginning and end of the season. Also, more care should be given to producing calves of high-producing quality for herd replacements.

Most of the farmers interviewed were selling cream for butter manufacture, or whole milk to be made into evaporated milk. The manufacture of evaporated milk has developed relatively recently and has resulted in some expansion in the size of herds.

The dairy herds now used for milk production are mainly of general-purpose breeding. Usually high-grade or purebred animals would be desirable and preferable for high rates of production. Failure to develop a better quality of dairy animal on the farms studied is due partly to



TABLE 4—Requirements for usual, recommended, and maximum production practices for dairying in Upshur County, West Virginia

PRACTICE	REQUIREMENTS TO MEET THE PRACTICE		
	Usual	Recommended	Maximum
<b>Cow herd:</b>			
Breeding of cows	Dairy and beef crossed	Dairy only	Purebred dairy
Breeding of bull	Beef	Purebred dairy (Same as predominant breed of cows)	Purebred dairy
Record of bull's dam	None	At least 300 lbs. B. F.	At least 400 lbs. B. F.
Milk record	None	Weigh milk twice each month	Daily record with Dairy Herd Improvement Association
Grain feeding—Method	Same to each cow	Feed according to milk production	Feed according to milk production
Grain feeding—Rate	2 to 4 lbs. per cow	1 lb. grain to each 3 to 4 lbs. milk <sup>1</sup>	1 lb. grain to each 2½ to 3½ lbs. milk
Grain—percent protein	16 to 18	16 to 18	16 to 20 <sup>2</sup>
Feeding dry cows	Some grain	Feed grain (low protein)	Feed grain (low protein)
Water supply	Run to creek	Twice daily to water with chill removed	Drinking cups
Herd replacement— How obtained How selected	Raised best cows	Raise best-producing cows	Raise best-producing cows
Dry period	8 weeks	8 weeks	8 weeks
Abortion	Tested	Test	Test
Tuberculosis Barnyard Roughage feeding	Tested No practice Mixed hay	Test Fence 2 tons legume hay per cow <sup>3</sup>	Test Fence 2 tons legume hay per cow <sup>3</sup>
Pasture period	Apr. 1 to Dec. 1	May 1 to Nov. 1	May 1 to Nov. 1
<b>Calves:</b>			
Whole milk to calves	12 to 14 weeks	4 to 6 weeks	6 weeks
Pasture supplement	None	July 15 to Sept. 1	July 15 to Sept. 1
Amount of grain to	1 to 2 lbs. day in winter	2 to 4 lbs. with mixed hay for winter feeding	5 lbs. with mixed hay for winter feeding
Age heifers bred <sup>4</sup>	12 to 18 months	15 to 18 months	16 to 18 months

<sup>1</sup>Under scarcity and high price for grain, some alternative use of high-quality roughages and pastures may make it desirable to reduce the grain-milk ratio as an economical farm-management practice.

<sup>2</sup>Depends on quality of roughage. If all hay is legume of good quality, then 16 percent is adequate. Feeding a higher protein content wastes the extra protein.

<sup>3</sup>If silage is fed, then half of the hay could be replaced by silage.

<sup>4</sup>Depends on breed. Jerseys may be bred earlier than other breeds.

past uncertainties about markets and to the poor quality and shortages of the feed supplies generally available. Many of the farmers are still strong in their belief that a "good calf," meaning one which will readily fatten for veal, is of more value to them than the increased milk production that can be realized later on through breeding higher-producing heifers to a good dairy bull for replacement purposes.

The greater care that a purebred herd would need might be too exacting in managerial requirements. The regularity of milking necessitated by high-producing cows, especially during the winter period, does not appeal to some farmers.

A contrast of usual and recommended levels of performing each practice shows that the dairy cows were usually bred to beef bulls. Most of the farmers interviewed had little idea of the milk-transmitting possibilities of the bulls they were using, even of the dairy herd, nor did they keep records of the production of the cows. When asked which cows they were using to produce calves for replacements, "the best cow" was the invariable response. When questioned further as to how they determined which was the best cow, they answered that it was easy to tell from the amount of milk the cow gave. While this may be a practical way to build up the milk production for home-use purposes, it is hardly adequate for efficient market production and for meeting competition from areas where more positive methods of determining high production are used.

The health of the herds in the sample of farms studied was usually fairly good. State laws require the control of Bang's disease and tuberculosis. As more intensive dairying is developed, it is highly probable that dairy-farm operators will need to practice greater care in the prevention and control of diseases.

Feeding practices varied widely from farm to farm and for different seasons on the same farm. Hay from permanent meadows and corn stover supplied the roughage on many farms. Most of the hay contained 20 percent or less legume, and the quality of nearly all of it had been reduced by late harvesting. Within individual herds, frequently all cows were fed the same amount of concentrates per head rather than varying amounts according to rate of milk production. Since most of the concentrates fed were purchased, probably the analysis was satisfactory.

Young stock were fed milk much longer than is considered economical, but they received less grain and a poorer quality of roughage than is usually recommended. Some of the heifers were bred earlier than is considered advisable, especially when the low rate of feeding is taken into account, but the number of farmers following this practice was not great.

Operators of large dairy farms came much nearer meeting requirements of highly important production practices than did those with small herds. Particularly significant were the breeding of the bull, the grain feeding and its protein content, and the feeding of the dairy calves. High milk production is closely associated with high net returns per cow. This is a strongly significant factor in enabling those operators who do

carry out better practices to increase their production.<sup>7</sup> In order to specialize in dairying, the operator must obtain better-than-average production and returns per cow.

TABLE 5—Requirements for usual, recommended, and maximum production practices for poultry in Upshur County, West Virginia

PRACTICE	DESCRIPTION OR UNIT	REQUIREMENTS TO MEET THE PRACTICE		
		Usual	Recommended	Maximum
<b>Hens:</b>				
System of feeding	xx	Mash and scratch	Mash and scratch	Mash and scratch
Period fed mash	Months	12 months on half of farms	12	12
Period hens confined	Months	Nov. or Dec. to April or May	Nov.-May	12
Breeding	One breed	No choice	Keep one breed only	Approved production strain
Floor space per hen	Sq. ft.	3	4	5
Separation of hens & pullets	xx	Not separated	Separate	Separate
Gather eggs	No. times daily	2	2	3-4
Egg storage	Type of room	Cellar	Cellar	Cellar
Death loss	Percent of Jan. 1 no.	10	10	0
<b>Chicks:</b>				
Hatchery	Cleanliness	No choice	Approved for sanitation	
Month started	Month	May or June	March or April	March
Breeding or grade	xx	No record	Sired by R. O. P.	R. O. P.
Pullorum test	xx	No test	Tested	Clean
Type of range	xxx	Old range	Clean range	Clean range
Death loss	Percent	17	Not to exceed 10	Not to exceed 10
Brooder preparation	xx	Clean	Clean	Clean
Separation of hens and chicks	xx	Not separated	Separate	Separate

<sup>7</sup>Miller, L. F., *op. cit.*, p. 19.

## Practices in Poultry Production

Having too small a size of flock on most farms to warrant adequate care probably accounts for much of the slow adjustment that has occurred in developing important practices necessary for higher rates of poultry and egg production. Only 10 flocks of 100 or more hens were found on the farms studied. About 50 of the flocks had 50 hens or fewer at the beginning of the year. Thus any attempt at a substantial expansion in poultry production must be accompanied by marked improvement in the quality of performance for each practice as the size of the flock is increased.

Recommendations for improvement differ from the usual way farm flocks are handled by suggesting that farmers select one breed, select higher quality of breeding stock, lengthen the period of feeding, follow more careful sanitation control, advance the time of hatching chicks, use more new grass range, increase the floor space per hen, and separate hens from the pullets (see Table 5). For maximum production the requirements are stepped up still further to include year-round confinement of hens, selection of replacements from approved production strains, still further increase of floor space per hen, and provision for more frequent gathering of eggs.

On most of the farms, baby chicks were bought for replacement purposes. These farmers were not much interested in breeding practices to build up egg production. Cross-breeding was frequently followed; very few of the flocks which were not crossbred were from flocks with good production records. Only one producer out of the entire sample purchased chicks which poultry specialists considered satisfactory for high production. Very few of the farmers had ever heard of the grades of chicks established by the National Poultry Improvement Plan. The chicks were bought on grades established by the hatcherymen. Each hatchery had its own grading system. The fact that the farmer bought the chicks graded "best" did not necessarily mean that he obtained chicks from high-producing strains.

Usually farmers provided less floor space per hen and were less careful with sanitary control measures than was necessary for best results. Death losses due to disease averaged 17 percent of all chicks started and were 10 percent in the laying flock. None of the farmers who used eggs from their own flocks for hatching had tested his flock for pullorum. Very few of those purchasing chicks knew whether or not these came from flocks tested for pullorum. The fact that most of the farmers reported having no outbreaks of disease during the year may signify failure to recognize that diseases were present when the death losses were scattered over the year.

Feeding practices were carried out better than many other practices, although the farmers usually did not feed as heavily as was recommended. Fifty-nine percent of the farmers fed both mash and scratch feed, and 55 percent fed mash all year. Since nearly all the mash fed was bought ready mixed, no attempt was made to determine its quality.



Housing facilities for handling poultry were usually in need of improvement. Fifty-seven percent of all farms allowed sufficient floor space per hen. On some of the farms only 1½ square feet of space per hen was provided. The hen houses were frequently poorly constructed and were cold, damp, and poorly lighted. Lack of new grass range was another very serious weakness.

Rearing practices may be greatly improved to reduce death losses from disease and to provide better-producing mature stock. Emphasis might well be centered on providing clean range instead of using the same area from year to year without change and on obtaining eggs or chicks from high-producing, pullorum-tested flocks. Eggs should be set to hatch in March or April rather than in May or June, as most farmers do now who hatch their own. Present death losses of 17 percent should be reduced by at least one-half through better selection of breeding stock and through greater care in maintaining sanitary conditions.

The relationship between type and size of farm and the extent to which requirements for different practices in poultry production were met varied greatly. Death losses of both hens and chicks were lowest on dairy farms, particularly on the larger farms. This seemed to be closely associated with a relatively high level of accomplishment for most of the desirable poultry-production practices. Subsistence farms tended to fall below average for all farms in many practices, but the larger general and livestock farms, likewise, were frequently weak in poultry practices.

### Practices in Beef Production

Production of livestock, particularly of beef cattle and sheep, has been the most important source of cash income in central West Virginia for many years. Production practices for beef cattle were limited to a relatively few important ones, but even in these the usual practices fell short of those recommended (see Table 6). The greatest differences between the way most farmers are now doing and the recommendations lie in the need for improved breeding of beef cows, in vaccinating for black-leg, in feeding concentrates, and in use of legume hay in the roughage. For maximum results the use of high-grade or purebred stock, together with higher rates of concentrate feeding and with legume hay and silage for roughage, is suggested. For calves the adoption of better feeding practices, both in quantity and in quality of concentrates and roughage, would be desirable over the usual feeding methods where they are held over winter.

Breeding herds of beef cattle were kept primarily on the rough hill farms. Some of the cattle produced there were taken to the pastures and meadows on the bottom lands for wintering. A few farmers fed a little grain during the winter, but usually very little was fed to the cattle at any time. The cattlemen who have improved the quality of their herds have benefited from the higher returns received. Unless farmers keep up the quality of animals produced, they cannot expect to command the



better prices. That an unfavorable condition exists widely was indicated by the prevalence of low-quality cows and grade bulls in the herds. Little vaccinating was done for blackleg. The feeding program usually included little or no concentrates, and the hay was composed mainly of grasses.

The West Virginia College of Agriculture believes that good commercial cows and good purebred bulls will sell readily. Many cattlemen produce feeder calves and sell them in October rather than hold them over the winter. According to the specialists, quality feeder calves have brought relatively good prices for the past several years, and they believe that more net income could be obtained by producing good calves and selling them as calves than by the present methods of wintering feeder calves and selling them as yearlings or older.

The farmers on larger sized general and livestock farms carried out most practices at more nearly the recommended levels of accomplishment than did those on smaller farms. The greatest advantages lay in improved breeding of cows and bulls, in vaccinating for blackleg, and in the quality and type of roughage fed. Farmers with smaller herds did relatively better in feeding roughage for a longer period and in feeding more concentrates, but the proportion of farms reaching recommendations for concentrate feeding was very low for groups of both sizes. There were few or no beef cattle on the dairy or subsistence farms.

TABLE 6—Requirements for usual, recommended, and maximum production practices for beef cattle in Upshur County, West Virginia

PRACTICE	REQUIREMENTS TO MEET THE PRACTICE		
	Usual	Recommended	Maximum
<b>Cow Herd:</b>			
Breeding of cows	Grade	Good grade	High grade
Breeding of bulls	Grade beef	Purebred	Purebred
Vaccination for blackleg	None	Vaccinate	Vaccinate
Abortion	Tested	Test	Test
Roughage—type	Mixed hay—mostly grass	Mixed hay—half legume	Legume hay and silage
Period fed roughage	Nov. to April	Nov. 20 to May 1	Nov. 20 to May 1
Amount of concentrate	None	1 to 2 lbs. per day <sup>1</sup>	1 to 2 lbs. per day <sup>1</sup>
<b>Calves: (wintering calves)</b>			
Roughage—type	Mixed hay	Legume hay	Legume hay with silage
Roughage—period fed	Nov. to May	Nov. to May	Nov. to May
Amount of concentrate	1-2 lbs. per head	2 lbs. per head <sup>2</sup>	10 lbs. per head <sup>3</sup>
<b>Calves: (with dam)</b>			
Concentrate	None	1 to 2 lbs. per day from about June 15 until weaning time—creep feeder	

<sup>1</sup>1-2 lbs. of soybean or cottonseed meal (protein supplement) if stover, straw, or grass hay is fed. If good legume hay and corn silage are fed then no supplement is needed.

<sup>2</sup>Protein supplement only if hay is of poor quality.

<sup>3</sup>To sell as fat yearlings.

It seems clear from these findings that much improvement in pastures, meadows, and grain production or purchase for feeding is essential before any great permanent increase can occur in the rate of beef-cattle production. And with such a feeding program there is need for a large measure of improvement in the quality of beef-cattle breeding-stock kept and in the sanitary safeguards followed. Greater specialization in both beef- and dairy-cattle production would be helpful in improving the quality of breeding stock for each purpose.

### Practices in Sheep Production

Sheep made up only a minor enterprise on the 27 farms reporting them. Flocks of 25 or more ewes were kept on only 4 of the farms covered in this survey. Since Upshur County is very light in sheep population, the practices were not as well developed as in the heavier sheep-producing areas. Most of the sheep were found on general and livestock farms, where a better quality of flock was reported, resulting from much better care. Only four dairy farms had sheep and these flocks were small and poorly tended. The menace of dogs, along with opportunities for more intensive uses of the land or with ease of managing other kinds of livestock, has been discouraging farmers in Upshur County from keeping up sheep production.

Prevailing practices were inadequate in view of recommendations. The levels recommended for meeting requirements for different practices varied most sharply from the farmer's usual way of handling sheep by suggesting improved breeding of ewes, positive parasite control measures, and a more substantial feeding program for both dry roughage and pastures along with better quality of roughage (see Table 7). For maximum production, increased emphasis should be centered on better breeding stock and on heavier feeding, both as to quantity and quality of feeds. Perhaps some additional emphasis would need to be given to early lambing.

Under usual farm practices, sheep were treated as scavengers and so received a minimum of care. The percentage of lambs to ewes bred was low, averaging only 1.15 lambs per ewe. The flocks consisted primarily of mixed native ewes, with only 37 percent of the flocks identified by the farmers as belonging to any breed. The rams were of somewhat better quality, 55 percent being reported as purebred. Treatment of the flocks for parasites was frequently neglected, 48 percent receiving no treatment and 15 percent being treated only once. Bluestone was most frequently used to treat the sheep. Not one of the flock owners treated the ewe flock according to recommendations, which consisted of fall, spring, and midsummer treatments with phenothiazine and of monthly treatments during the summer with nicotine sulphate/blue vitriol. Some of the farmers used treatments which could be put in the feed. They had been told that these were "just as good" and were inclined to take the easier way out.

The larger general and livestock farmers followed the important practices in sheep production at recommended levels more frequently than did other farmers. All farms ranked relatively high in rate of grain feeding, in number of weeks the ewes were fed grain, in providing shelter, and in docking lambs. But all were low in treatment for parasites, in quality of breeding ewes, in restricting the pasture period for dependence on feed, and in castrating the lambs. Since much of the effectiveness in production depends on these latter practices, it only emphasizes how essential it is to combine good practices lest the advantage of any one alone be largely lost.

Eighty percent of the operators of large general and livestock farms fed legume or good mixed hay to sheep, but most of the farmers having sheep fed hay a shorter period than was advisable. On many farms hay was fed only during bad weather. Farmers claimed that the sheep would not eat hay when the weather was open. Nearly all of the sheep grazed

TABLE 7—Requirements for usual, recommended, and maximum production practices for sheep in Upshur County, West Virginia

PRACTICE	REQUIREMENTS TO MEET THE PRACTICE		
	Usual	Recommended	Maximum
<b>Ewes:</b>			
Breeding of ewes	Mixed native	From a purebred ram	Good commercial grade ewes
Breeding of ram	Purebred	Purebred	Purebred
Parasite treatment	None	Phenothiazine spring, fall, July: nicotine and copper sulphate every summer month	
Hay fed ewes <sup>1</sup>	Mixed hay, low legume content	Legume or mixed hay	Silage and legume hay
Period fed hay	Bad weather	December 1 to April 15	December 1 to April 15
Period ewes fed grain	4 weeks	4 to 6 weeks	6 weeks
Rate of feeding	1 lb. per head	½ to 1 lb. per day	1 lb. <sup>2</sup>
Type of shelter	Shed	Dry shed which shelters from wind	Dry shed which shelters from wind
Flushing of ewes	Flushed	Flush	Flush
Length of permanent pasture period	All year	April 15 to December 1	April 15 to Dec. 1 with grain pasture in winter
<b>Lambs:</b>			
Docking of lambs	Docked	Dock	Dock
Castrating of lambs	Not castrated	Castrate	Castrate
Month lambs dropped	March-April	March-April	Feb.-March

<sup>1</sup>Farmers having both cattle and sheep usually feed the best hay to the sheep.  
<sup>2</sup>For **maximum** production of lambs they should be creep fed with a self-feeder while on pasture, though this will usually not be the most economical when good pastures are available.

or ranged on pastures all year. While this practice is harmful to the pastures, sheep-production specialists are of the opinion that the exercise benefits the sheep. The pasture also provides some nutrients which partly offset the deficiencies of the hay ration the sheep receive.

While the quantities of grain fed to ewes were adequate, according to the farmers' own estimates, most frequently the ration consisted of a single grain such as corn. A mixture of corn, oats, and bran would in some cases have been preferable. Most of the farmers on the general and livestock farms thought they flushed the ewes. The most frequent practice was to turn the ewes into the hay meadows after the first crop of hay had been cut. None of the farmers fed grain at this time. The efficiency of the additional pasture as a flushing treatment may be questioned on the basis of the small number of twin lambs dropped.

Most of the lambs were dropped during March and April. While this is satisfactory for general farms, it would be better to have most of the lambs born in March if the sheep enterprise is to be made important. Eighty-one percent of the farmers docked the lambs, but only 44 percent castrated the ram lambs. They maintained that ram lambs gained weight more rapidly than those castrated and that no price differential was paid for castrated lambs. Livestock specialists state that this view is correct as long as the lambs are sold young, but if the lambs are held too long, the rams develop sexually instead of fattening and are graded down. Castration appears to be a necessary safeguard against such down-grading.

Lambs were generally sold on grade. Of the total number sold 39 percent graded blue, 44 percent red, and the balance were sold as ungraded or as culls. Many of the farmers felt that their lambs were being graded too closely.

Probably there is much land that could be utilized effectively with sheep. But for this to be done economically, it seems apparent from this analysis of existing levels of important practices for sheep production, that the sheep will need to be handled in sufficiently large flocks to make it worth while for the operator to develop a degree of skill and experience in carrying out the recommended management practices successfully.

## SUMMARY

This study is an inquiry into existing farm practices in Upshur County and contrasts with recommended levels for such practices. The degree to which recommendations were followed was arrived at by contrasting the requirements for each level with farmers' actual performances.

The study included corn, timothy and clover hay, and pasture among crop enterprises, and dairying, poultry, beef cattle, and sheep among livestock enterprises. Practices for crops fall mainly into three important groups, as follows: rate of applying manure, lime and fertilizer, and fertilizer analysis; rate and date of seeding, variety used, and seed treatment; and cultural practices. Livestock practices group mostly around breeding, feeding, and disease and pest control.



Crop practices were in need of substantial improvement much more for hay and pasture than for corn. Of these, heavier liming and fertilization for both hay and pasture are desirable; better care of pasture through closer control of the grazing period and through clipping the pasture weeds should help greatly. The use of a shorter rotation of hay land by leaving it down only 1 to 2 years, more timely seeding of the clover and timothy, and heavier fertilization of the nurse crop would help improve hay production.

Livestock practices had a noticeable tendency to be weak in each enterprise for the same practice or group of practices. Breeding was usually in need of improvement toward higher-producing foundation stock. Much more progress seemed to have been made with beef cattle than with dairy cattle, poultry, and sheep. Maintenance of good sanitary conditions, except where required by law, seemed to lag more behind recommendations than did many other practices; particularly was this true in disease and pest control in sheep and poultry. Feeding practices usually fell below recommendations. It is desirable to have both breeding and sanitation on a high level, if feeding is to be most profitable. Increasing the feeding rates to animals of poor breeding or to those contaminated with diseases or parasites reduces efficient use of feeds.

The profitableness of adopting improved practices was not made a part of this study. Previous studies by members of the College of Agriculture staff show significant relationships between improved rates of production and returns. The connection intended between the results of this study and that of returns to the farmer was one of showing wherein farmers were doing, or not doing, those things that would be most conducive to bringing about higher rates of production per acre. Under usual farming conditions, these higher rates have been shown to be associated with better returns to farm operators for the use of their resources.







